Feb. 12, 1963 W. F. WARD ETAL 3,077,159

VARIABLE STROKE RECIPROCATING MECHANISM

Filed Feb. 10, 1961 5 Sheets-Sheet 1

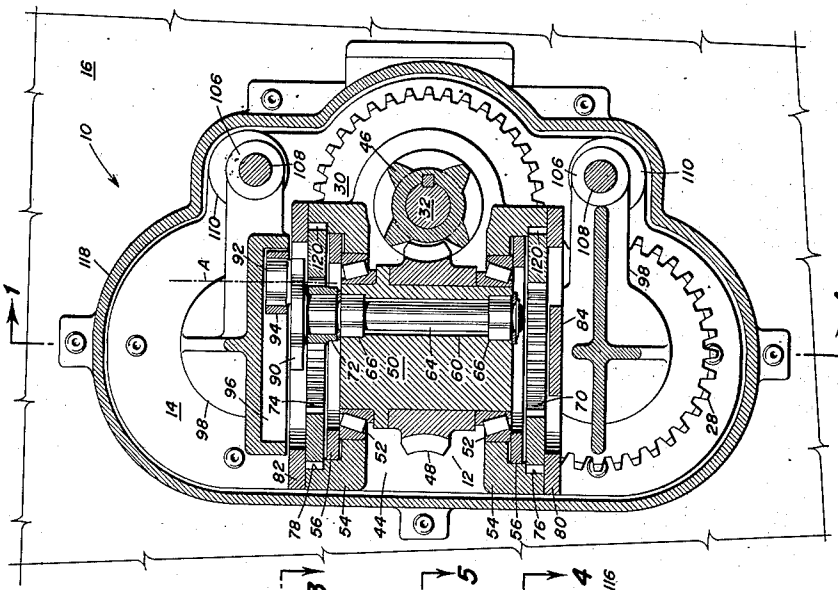


FIG. 2.

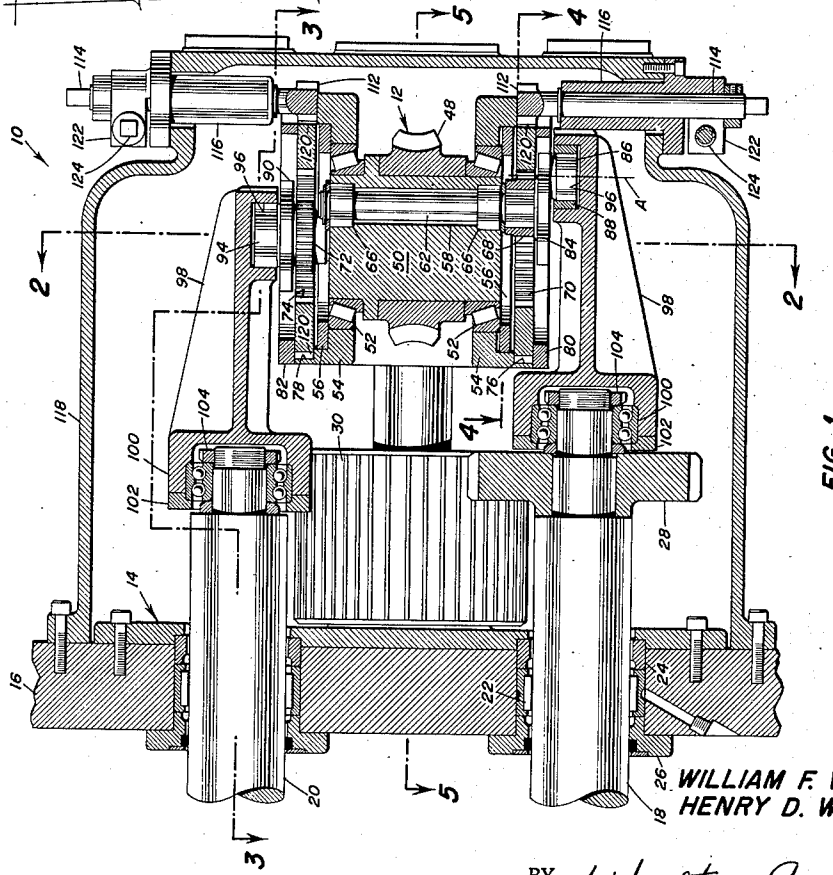


FIG. 1.

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VARIABLE STROKE RECIPROCATING MECHANISM

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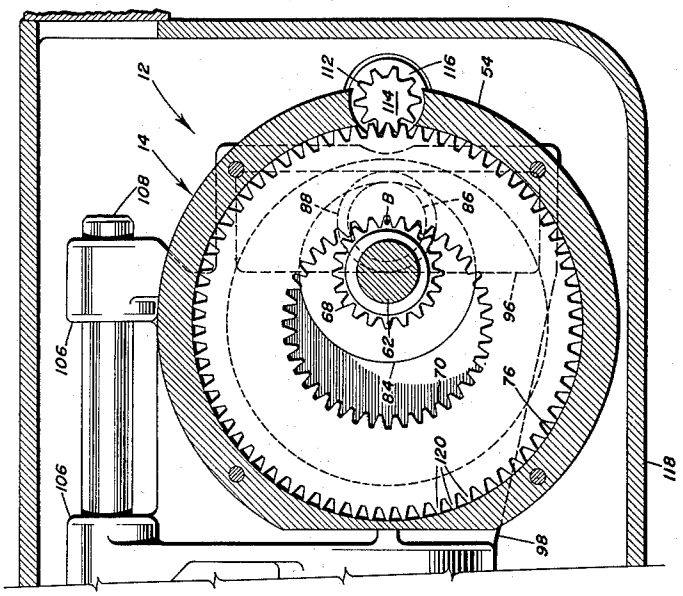


FIG. 4.

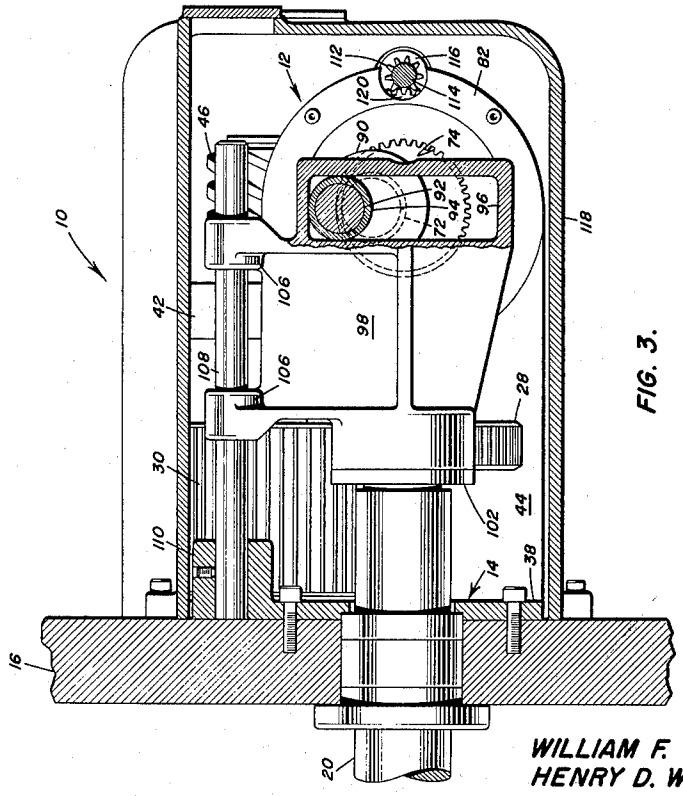


FIG. 3.

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VARIABLE STROKE RECIPROCATING MECHANISM

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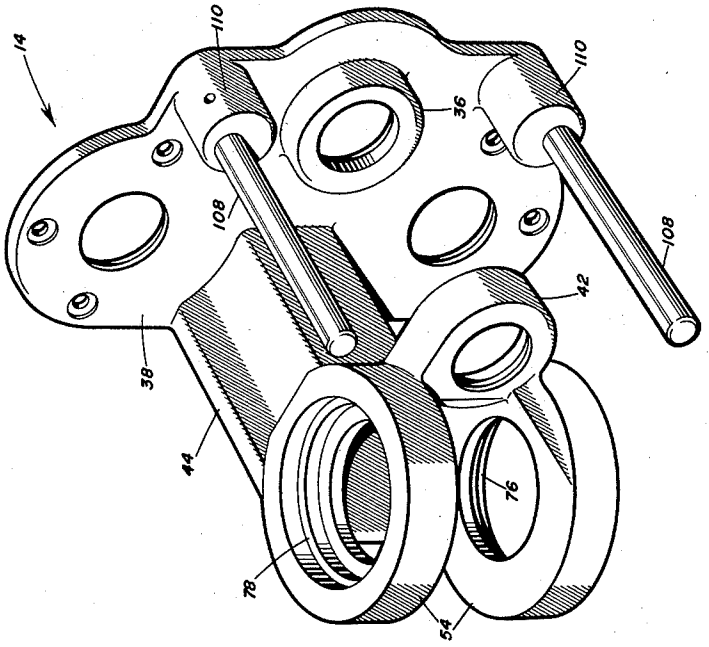


FIG. 6.

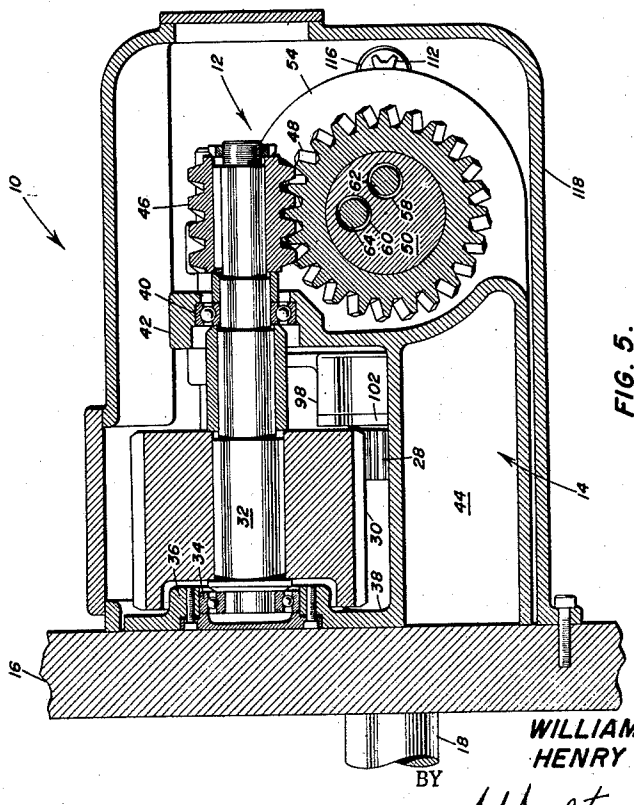


FIG. 5.

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VARIABLE STROKE RECIPROCATING MECHANISM

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FIG. 7A.
NO-STROKE SETTING

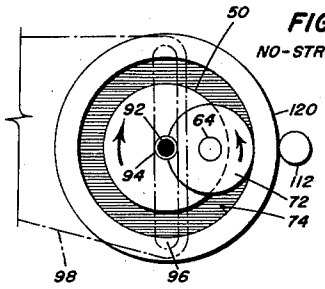


FIG. 7B.

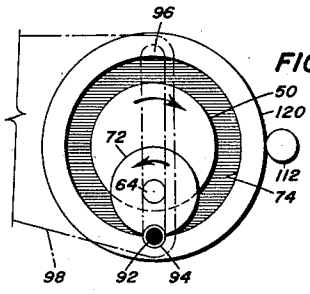


FIG. 7C.

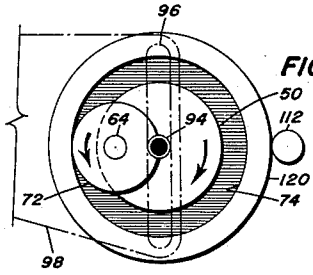


FIG. 7D.

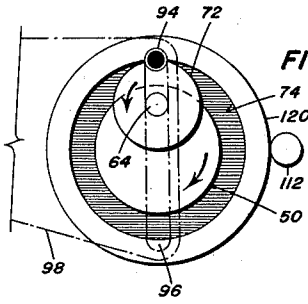


FIG. 8A.
PARTIAL STROKE SETTING

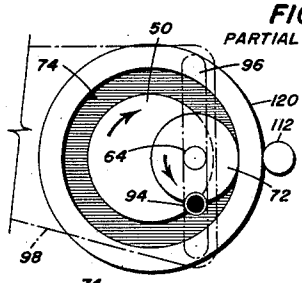


FIG. 8B.

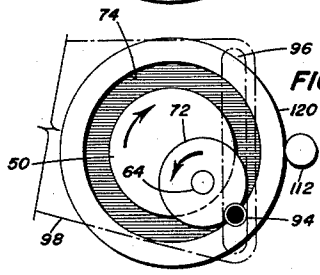


FIG. 8C.

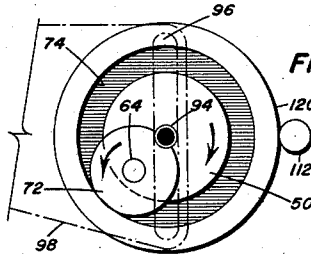


FIG. 8D.

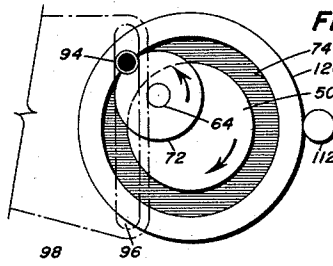
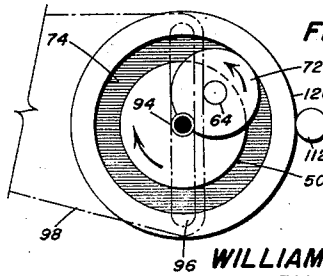


FIG. 8E.



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VARIABLE STROKE RECIPROCATING MECHANISM

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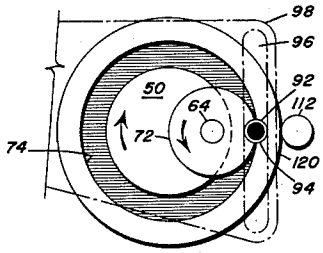


FIG. 9A.
FULL-STROKE SETTING

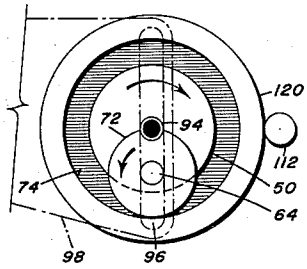


FIG. 9B.

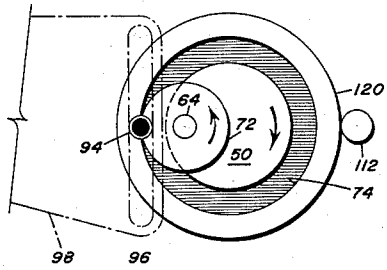


FIG. 9C.

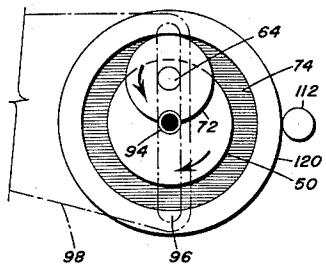


FIG. 9D.

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United States Patent Office 3,077,159 Patented Feb. 12, 1963

3,077,159

VARIABLE STROKE RECIPROCATING MECHANISM

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Filed Feb. 10, 1961, Ser. No. 88,332
9 Claims. (Cl. 101—349)

This invention relates generally to printing machinery, and specifically to a mechanism for reciprocating inking rollers in a printing press and a means for varying the length of the stroke of the inking rollers.

It is an object of this invention to provide a mechanism for reciprocating inking rollers in a printing press and for varying the length of stroke of the inking roller.

Still another object of this invention is to provide a variable stroke reciprocating mechanism for use with inking rollers in printing machinery.

And still another object of this invention is to provide a unique variable stroke reciprocating mechanism which is economical to manufacture, efficient, and reliable in operational use, and which is easy to install and maintain.

These objects and other objects and advantages of this invention will become more apparent from the following detailed specification and accompanying drawings in which:

FIG. 1 is an axial section through a roller reciprocating mechanism incorporating features of the invention and is taken along line 1—1 of FIG. 2;

FIG. 2 is a vertical cross section taken along line 2—2 of FIG. 1;

FIG. 3 is a horizontal section taken along line 3—3 of FIG. 1;

FIG. 4 is a fragmentary horizontal section, somewhat similar to FIG. 3, on an enlarged scale and is taken along line 4—4 of FIG. 1;

FIG. 5 is a further horizontal section taken along line 5—5 of FIG. 1;

FIG. 6 is a detail perspective of one of the structural elements of the variable stroke reciprocating mechanism;

FIGS. 7A through 7D are schematic views illustrating the cycle of operation of the variable stroke reciprocating mechanism when adjusted to a no-stroke setting;

FIGS. 8A through 8E are schematic views illustrating the cycle of operation of the variable stroke reciprocating mechanism when adjusted to a partial-stroke setting; and

FIGS. 9A through 9D are further schematic views illustrating the cycle of operation of the variable stroke reciprocating mechanism when adjusted to a full-stroke setting.

Referring now to FIGS. 1 through 6 of the drawings, the variable stroke reciprocating mechanism **10** consists basically of a gearing arrangement **12**, which is suspended by means of a main bracket **14** from a printing press side frame **16** so as to receive rotational drive from a driven inking roller **18**.

The gearing arrangement **12** translates the rotational drive to a linear motion which is re-applied to the driven roller **18** and to an idler inking roller **20** so as to reciprocate both rollers **18** and **20** along their axes for the well known purpose of distributing ink as will now be explained.

The inking roller **18**, which is remotely driven, is journalled in a roller bearing **22**, which is secured in a sideframe **16** by retaining rings **24** and **26**. A gear **28** is secured near the shown end of inking roller **18**, which meshes and drives a broad faced gear **30**.

The gear **30** is fixed to a short shaft **32**, the left end of which is journalled in a bearing **34** located in a bearing boss **36** formed in a mounting plate **38** of a main

bracket **14**, shown best in FIG. 5. Approximately midway of its ends, the shaft **32** is journalled in a second bearing **40** which is carried by a cantilever boss **42** suspended from the end of an arm **44** which is formed integrally with and extends outwardly from the mounting plate **38**.

A multiple pitch worm **46** is keyed to the right hand end of the shaft **32**, and it drives a worm gear **48**. The worm gear **48** is secured to a short, comparatively large diameter shaft **50** whose upper and lower ends are journalled by bearings **52** carried by the spaced upper and lower cantilever bosses **54** formed at the outer end of arm **44**. The bearings **52** are restrained against axial movement by flat rings **56**.

The shaft **50** is provided with a pair of eccentrically arranged parallel bores **58** and **60** spaced substantially 90° apart as best viewed in FIG. 5. Each of the bores **58** and **60** receives a shaft **62** and **64**, respectively, journalled in spaced bearings **66**.

Shaft **62** is provided at its lower end with a gear **68** which walks around within a lower ring gear **70** when the shaft **50** is rotated and similarly the shaft **64** is provided at its upper end with a gear **72** which walks around within an upper ring gear **74**. The ring gears **70** and **74** are received in close fitting counterbores **76** and **78**, respectively, which are provided in bosses **54**. Ring gears **70** and **74** are secured against axial movement by retainer rings **80** and **82**, respectively.

Shaft **62** is provided at its lower end, adjacent gear **68**, with a flange **84** whose outer surface is provided with an eccentric drive boss **86** which carries a roller **88**. Similarly, shaft **64** is provided at its upper end, adjacent gear **72**, with a flange **90** whose outer surface is provided with an eccentric drive boss **92** which carries a roller **94**.

It should be noted that drive bosses **86** and **92** are located so that their respective axes directly overlie the pitch diameters of their respectively adjacent gears **68** and **72** so that a plane on which lies the axis of boss **86** will be tangent to the pitch diameter of the gear **68** and similarly a plane on which lies the axis of boss **92** will be tangent to the pitch diameter of gear **72**. This can best be illustrated at lines A in FIGS. 1 and 2, at point B in FIG. 4, and in FIGS. 7A through 9D.

It is well known that when the pitch diameter of a gear is exactly half the pitch diameter of a ring gear in which it is travelling, then any given point on the pitch diameter of the inner gear will traverse a straight line. The pitch diameter of the gears **68** and **72** is exactly half the pitch diameter of the ring gears **70** and **74**; consequently, the axes of drive bosses **86** and **92** will move along a straight line when gears **68** and **72** are caused to walk around in ring gears **70** and **74**, respectively, when worm gear **48** is rotated.

Rollers **88** and **94** each are located within an elongated slot **96** provided in a pair of drive yokes **98**. The left end of each drive yoke **98** is secured through the bearings **100**, retainer rings **102**, and locknuts **104** to its associated ink roller **18** or **20** so as to reciprocate the ink rollers **18** and **20** axially without restricting their rotation.

In order to prevent any misalignment of the yokes **98** as they are driven by their respective rollers **88** and **94**, a pair of guide bosses **106** are arranged on each yoke **98** so as to travel along one of the pair of cantilever guide rods **108**. The guide rods **108** are secured in bosses **110** on the mounting plate **38**.

Before proceeding with a discussion of the principles illustrated in FIGS. 7A through 9D, it should be pointed out that for purposes of simplicity and clarity only those reference numerals assigned to the upper gearing elements, as viewed in FIGS. 1 and 2, shall be used. However, the same principles apply to the lower gearing elements.

It will be clearly seen from an examination of FIGS. 7A through 9D that the length of stroke of drive yoke **98** depends entirely upon the relative positioning of the drive boss **92** and the roller **94** with respect to the point of contact or mesh between inner gear **72** and the ring gear **74**. The figures are arranged in three groups, namely FIGS. 7A through 7D which illustrate a full cycle of operation with the variable stroke reciprocating mechanism **10** set for no stroke; FIGS. 8A through 8E illustrating a full cycle at a partial-stroke setting of the variable stroke reciprocating mechanism **10**; and FIGS. 9A through 9D illustrating a cycle of operation with the variable stroke reciprocating mechanism **10** set for full-stroke operation.

The first figure of each group, namely FIGS. 7A, 8A, and 9A, shows shaft **64** and its gear **72** in the same relative position with respect to the ring gear **74**. However, the positions of roller **94** differ. In FIG. 7A, roller **94** is shown 180° away from the point of mesh between the gear **72** and the ring gear **74**.

Following FIGS. 7A through 7D, it will be noted that clockwise rotation of the shaft **50** will drive gear **72** counterclockwise around ring gear **74** causing roller **94** to move along a vertical path in slot **96**, thus allowing drive yoke **98** to remain stationary.

In FIG. 8A, roller **94** is positioned 90° away from the point of mesh between the gear **72** and the ring gear **74**. As noted from FIGS. 8B through 8E, clockwise rotation of shaft **50** will drive gear **72** counterclockwise, thereby causing the roller **94** to move in a straight diagonal path from the lower right to the upper left thus driving the guide yoke **98** through a shortened stroke.

In FIG. 9A, the axis of the roller **94** is shown directly over the point of mesh of the gear **72** and the ring gear **74**. By following FIGS. 9A through 9D, it will be noted that clockwise rotation of shaft **50** will drive the gear **72** counterclockwise, thus causing the roller **94** to traverse a straight horizontal path, thereby driving the guide yoke **98** through a full stroke.

The repositioning of the rollers **94** and **88**, to allow a variety of stroke lengths, is achieved simply and in novel fashion by means of a pair of manually rotatable pinions **112** provided on the inner ends of shafts **114** located in housing **116** which are secured to an outer cover case **118**. Pinions **112** engage gear teeth **120** formed around the outer periphery of ring gears **70** and **74**. Manual rotation of the shaft **114** will cause the pinion **112** to rotate ring gears **70** or **74** as well as inner gears **68** or **72**, thus repositioning rollers **88** or **94** and changing the stroke of the drive yokes **98**.

Housings **116** are formed at their outer ends in a conventional split clamp arrangement **122** so as to lock the shaft **114**, by means of a bolt **124**, against rotation upon completion of stroke adjustment.

It should be further noted that ring gears **70** and **74** may be separately adjusted, while the printing press is stationary or in operation, for different length strokes. That is, one inking roller **18** or **20** may be set for full stroke and the second ink roller for no stroke, if so desired.

It should be further noted that as shown best in FIGS. 1, 2, and 5, shafts **62** and **64** are positioned approximately 90° apart. This is an arbitrary arrangement which keeps the reciprocation of the inking rollers **18** and **20** 90° out of phase. The bores **58** and **60** could be drilled 180° apart to keep rollers **18** and **20** 180° out of phase or, if desirable, gears **68** and **72** could conceivably be installed on opposite ends of a single shaft, say shaft **62**, thereby reciprocating rollers **18** and **20** in phase.

Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood than within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In combination, a driving roller, a first shaft positioned substantially perpendicular to the longitudinal axis of said driving roller, said first shaft having at least one eccentrically arranged longitudinal bore, gear means to impart rotational motion of said driving roller to said first shaft, a second shaft rotatably secured in each said bore in said first shaft, a ring gear mounted adjacent an end of each said second shaft, a walking gear mounted on each said second shaft and adapted to traverse its respective ring gear upon rotation of said first shaft, an idler roller, means including a drive boss mounted on each said walking gear, the motion of each drive boss being essentially planar, yoke means rotatably connected with said driving roller and said idler roller and adapted to receive each drive boss, whereby the essentially planar motion of each drive boss is translated into reciprocatory motion of said driving roller and said idler roller.

2. The combination of claim 1, wherein said gear means to impart rotational motion of said driving roller to said first shaft, comprises, a driving gear secured to said driving roller, a first worm gear secured to said first shaft, a broad faced gear in engagement with said driving gear, said engagement being retained during reciprocation of said driving roller and said reciprocating roller, and a second worm gear driven by said broad faced gear and coacting with said first worm gear.

3. The combination of claim 1, wherein two eccentrically arranged longitudinal bores are provided in said first shaft and hence two second shafts are provided and a ring gear is mounted adjacent an opposite end of each said second shaft.

4. The combination of claim 3, wherein said two eccentrically arranged longitudinal bores are located about 90° from each other.

5. The combination of claim 3, wherein said two eccentrically arranged longitudinal bores are located about 180° from each other.

6. In combination, a driving roller, a fixed support, means including a first shaft rotatably secured in said fixed support and positioned thereby substantially perpendicular to the longitudinal axis of said driving roller, said first shaft having at least one eccentrically arranged longitudinal bore, means including a broad faced gear to impart rotational motion of said driving roller to said first shaft, a second shaft rotatably secured in each said bore in said first shaft, a ring gear mounted adjacent an end of each said second shaft, a walking gear mounted on each said second shaft and adapted to traverse its respective ring gear upon rotation of said first shaft, each said walking gear having a flange mounted thereon, means including a drive boss mounted on each said flange eccentrically with respect to the longitudinal axis of its respective second shaft, the motion of each drive boss being essentially planar, an idler roller, yoke means rotatably secured to said driving roller and said idler roller and having a transverse slot adapted to receive each drive boss, whereby the essentially planar motion of each drive boss is translated into reciprocatory motion of said driving roller and said idler roller.

7. A mechanism for converting continuous rotary motion of a driving ink distributing roller into simultaneous reciprocation and rotation thereof and an idler ink distributing roller, comprising, a first shaft positioned substantially perpendicular to the longitudinal axis of said driving ink distributing roller, said first shaft having at least one eccentrically arranged longitudinal bore, means including a broad faced gear to translate rotary motion of said driving ink distributing roller into rotary motion of said first shaft, a second shaft rotatably secured in each said bore in said first shaft, a ring gear mounted adjacent an end of each said second shaft, a walking gear mounted on each said second shaft and adapted to traverse its respective ring gear upon rotation of said first shaft, an eccentric boss means mounted on each said walking gear, the motion of each boss means being essentially planar, yoke means rotatably connected to said driving and said

idler ink distributing rollers and having a traverse slot adapted to receive each boss means, whereby the essentially planar motion of each boss means as supplied by rotation of said driving ink distributing roller and said first shaft is translated into reciprocatory motion of said driving and said idler ink distributing rollers.

8. A mechanism for converting continuous rotary motion of a driving ink distributing roller into simultaneous reciprocation and rotation thereof and an idler ink distributing roller, comprising, a fixed support, means including a first shaft rotatably secured in said fixed support and positioned thereby substantially perpendicular to the longitudinal axis of said driving ink distributing roller, said first shaft having a pair of eccentrically arranged longitudinal bores, means including a broad faced gear to translate rotary motion of said driving ink distributing roller into rotary motion of said first shaft, a pair of second shafts rotatably secured in said pair of eccentrically arranged longitudinal bores, respectively, a pair of ring gears mounted adjacent opposite ends of said pair of second shafts, a walking gear mounted on each second shaft and adapted to traverse its respective ring gear upon rotation of said first shaft, an eccentric boss means mounted on each said walking gear, the motion of each boss means being essentially planar, a pair of yoke means rotatably connected to said driving and said idler ink distributing

rollers, respectively, each yoke means of said pair having a transverse slot adapted to receive its respective boss means, whereby the essentially planar motion of each boss means as supplied by rotation of said driving ink distributing roller and said first shaft into reciprocatory motion of said driving and said idler ink distributing rollers.

9. The mechanism of claim 8 and in addition means to independently rotate each ring gear of said pair to independently change the distance between the axis of each eccentric boss means and the longitudinal axis of said first shaft, whereby the amplitude of reciprocation of said driving and said idler ink distributing rollers is separately variable and controllable.

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